

I. List 3-5 Student Learning Outcomes for students enrolled in your program.

These should be broad overarching learning goals. They are bigger than objectives.

After completing the entire Engineering Transfer program, students will have attained the following:

- 1) an ability to apply knowledge of mathematics, science, and engineering
- 2) an ability to design and conduct experiments, as well as to analyze and interpret data
- 3) an ability to identify, formulate, and solve engineering problems
- 4) an ability to communicate effectively
- 5) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

These SLO's represent a partial list of outcomes from "2008-2009 Criteria for Accrediting Engineering Programs", ABET (see Fig ENGG LS1).

II. Align the Program Level SLOs with the College Goals.

Briefly discuss how your program meets the goals of the college.

In general, the Engineering Transfer Program is an important part of the college's overall transfer program. It is integral to the viability of the Math program and the Physical Sciences program due to the large representation of Engineering students within chemistry, physics, and upper level math classes. Additionally, the success of Engineering transfer students in UC and CSU Engineering programs contributes to the reputation of COM as an excellent academic transfer institution, and the important professional contributions of COM Engineering alumni engenders good will within the community.

1. Educational excellence--faculty in all of the Physical Sciences and Engineering disciplines maintain high academic standards and use educational best practices to adequately prepare students to succeed after transfer. All part-time and full-time ENGG instructors are well qualified, with either an M.S. or Ph.D. in Engineering, professional work experience, and considerable post-secondary teaching experience.

2. Curricular diversity--the COM Engineering program is committed to offering the full range of courses needed by students to transfer into any Engineering major at UC or CSU.

3. Well-scheduled offerings--all disciplines within the Math, Life/Earth Sciences, and Physical Sciences departments work closely with each other to schedule courses with the goal of minimizing conflicts and maximizing flexibility for students so that they can complete their transfer requirements with optimal efficiency.

4. Strong relations with 4-year institutions--the FT Engineering instructor regularly attends annual meetings of the ELC, the statewide intersegmental organization that supports Engineering transfer education in CA. These meetings provide opportunities to discuss curriculum, transfer, and articulation issues with representatives of all UC, CSU, and independent universities, as well as to share educational best practices with other CC Engineering faculty.

5. Supportive Learning Environment--all faculty within the Physical Sciences are expected to create an interactive classroom environment in which students are encouraged to ask questions and are challenged to maximize their learning potential. Faculty also commit to making themselves accessible to students outside class, not only to answer course-related questions but also to provide guidance to students regarding academic and professional aspirations.

6. Inviting Physical Environment--Physical Sciences and Engineering faculty and staff have contributed extensively toward the design of a new Math/Sciences building (as well as contributing to campus-wide planning efforts). In addition to ensuring that the instructional spaces will function optimally to support future student learning, faculty and staff have provided considerable insights and support toward creating a building that is inviting to students, encourages informal learning opportunities, and adheres to sustainable architectural principles.

II. Assess the student success in your program.

How do you know students learned the core SLOs by the completion of curriculum/program. Include data to support these findings.

SLO(1): Because of the highly sequential nature of the Engineering transfer curriculum, upper level ENGG courses build heavily upon knowledge and skills developed in earlier Math, Chemistry, and Physics courses. The increasingly high rates (>90%) of retention and success in the ENGG courses suggests mastery of the pre-requisite math and science abilities at earlier levels, as well as the ability to apply this knowledge to engineering problems.

SLO(2):

*All CHEM and PHYS courses in the ENGG program have laboratory components which require students to conduct experiments, and to analyze and interpret data from those experiments.

*The in-house lab manual developed for the CHEM 131/132 courses emphasizes in particular an inquiry-based approach which requires students to demonstrate experimental design skills.
 *Although the Materials course (ENGG 245) is the only currently offered ENGG course with a formal lab component, this SLO has been partly addressed in the "lecture-only" courses by incorporating data analysis and interpretation problems within exams and assignments.
 *Additionally, the Statics course (ENGG 235) includes several "Activity Days", as well as take-home activity and design assignments, which require students to perform data collection and analysis, and to interpret data with respect to theoretical models.

SLO(3):

*This SLO is at the core of traditional engineering academics and is evaluated in virtually all exams and assignments in the ENGG courses.
 *The highly interactive nature of ENGG "lectures", coupled with very small class sizes and engaged instructors, permits continual demonstration, evaluation, and improvement of problem solving skills.
 *The high success rates (>90%) and relatively high grade distributions in ENGG courses indicate that the vast majority of ENGG students are able to achieve this learning outcome at high levels of proficiency.

SLO(4):

*ENGG courses address communication skills in terms of accepted professional standards for: Engineering notation and graphics, documentation of problem solutions, presentation of data and analysis, written technical prose, oral presentation skills, and interpersonal communication in work teams. These outcomes are assessed via homework assignments, exams, laboratory and design reports, oral presentations, and observations of group interactions.
 *ENGG transfer students are required to complete 2 courses in written communication (English 150 & 151), and most are also required to take a Speech course.

SLO(5):

*Standard engineering problem-solving techniques and skills are addressed throughout ENGG courses, and are evaluated on all exams and assignments.
 *Use of computational tools (e.g., Excel, MATLAB, PSpice, AutoCAD, etc.) is incorporated into all of the ENGG courses. Students demonstrate mastery in application of tools via submitted assignments.
 *Standard laboratory instrumentation and testing equipment is incorporated into all CHEM, PHYS, and ENGG lab courses, with increasing upgrades to modern digitization and computer control, as instructional equipment budgets allow. Learning outcomes are assessed via observations of student performance during lab, and via presentation and interpretation of results in lab reports.

OVERALL:

*Evidence of successful overall attainment of program SLOs includes:
 **high transfer rates (virtually 100% of students who complete ENGG courses successfully transfer)
 **a high proportion of successful admits to UC Berkeley and UC Davis (two of the most well respected and competitive Engineering programs nationally)
 **anecdotal evidence of post-transfer success, including significant numbers of former students in graduate Engineering programs.
 *Despite very low enrollments in ENGG courses, ENGG ranked 7th largest among all COM disciplines in terms of total transfers in 2005, based upon data from CPEC (see Fig ENGG LS3).
 *It is likely that ENGG would rank even higher in terms of the number of students who complete their degrees after transfer. As reported in 2002 by the UC Office of the President (see Fig ENGG LS4), statewide CC transfers to UC in Engineering had the highest degree completion rate of all disciplines, and was the only discipline in which transfers achieved both higher GPA's and comparable completion rates, as compared to "native" UC students.

IV. Document student success/achievement in the program.

Possible documentation materials might include Degrees, Awards, Transfer, Portfolios, Capstone Assignments, Success in Job Placement, etc.)

Please see the following attachments:

Fig ENGG LS1. ABET Program Outcomes
 Fig ENGG LS2. Retention and Success Rates
 Fig ENGG LS3. Transfers by Discipline 01-05
 Fig ENGG LS4. Post Transfer Performance at UC by Discipline

V. Note areas for future improvement.

Address needs of program like curricular innovation, resource allocation, upgrading facilities, technology, unit allocation, staffing, etc.

1. Addition of ENGG 220L lab course is needed to strengthen attainment of SLO's 2 and 5, especially for those students who are not required to take ENGG 245 (the only current ENGG course with a lab component). Resources needed for 08-09: additional 2.5 TU annually, and funding to purchase necessary instructional equipment.

2. Despite some recent significant funding of instructional equipment for chemistry and physics, considerable facilities and equipment modernization are still needed for the entire Physical Sciences program, and especially Engineering, in order to properly attain SLO's 2 & 5. Current bond modernization efforts will hopefully provide some further capital improvements in these areas, but predictable and appropriate ongoing equipment and supply budgets will also be needed to maintain a modern equipment inventory.

3. The program is currently doing a poor job of addressing several program level SLOs not in the list above that relate to engineering design skills, and to a variety of "social science" knowledge and skills (see Fig ENGG LS1 for list). Although the ENGG 110B Intro to Engineering Design course was created in 2003 specifically to address these new national ABET SLO criteria for engineering programs, it has never been offered due to resource limitations and concerns about potential low enrollment. At the time, the course was a transfer requirement for SJSU, but was not required for UCB, UCD, or SFSU (the primary destinations of COM engineering students). A similar course has now been adopted as a transfer requirement for SFSU, and is likely to be soon at UCB. The need to offer and possibly to modify the ENGG 110B course will be evaluated and presented in next year's Program Review. Adding the course to the curriculum would have both resource (i.e., TU and equipment) and staffing implications, since the department is already burdened by a shortage of full-time faculty. However, the course provides interesting synergistic opportunities to attract additional students, to serve as an outreach tool, and to address a number of emerging societal/community issues such as energy sustainability.

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